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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/481,803 08/31/98 TAVKHELIDZE

A

EXAMINER

MM91/1107

Borealis Technical Limited
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TAMAIL K	
ART UNIT	PAPER NUMBER

2834

DATE MAILED:

11/07/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/481,803

Applicant(s)

TAVKHELIDZE ET AL.

Examiner

Tamai IE Karl

Art Unit

2834

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 September 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 and 22-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 6 is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-18 and 22-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

Drawings

1. The objection to the drawings is withdrawn.

Specification

2. The amended title "Thermionic Vacuum Diode Device with Positioned Electrode" has been entered into the file wrapper. The new title is not descriptive of the claimed invention. A new title is required that is clearly indicative of the invention to which the claims are directed, such as "Thermionic Vacuum Diode Device with Adjustable Electrodes".
3. The substitute specification filed 9/14/2001 has been entered into the file wrapper.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 18 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

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Claims 18-22 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. The specification does not enable or contain a full, clear, concise, and exact written description of a conversion device that will generate an AC voltage. Particularly the specification does not disclose a single "means for" causing the oscillation of the manipulation means.

Claim Rejections - 35 USC § 101

6. The rejection of Claims 18-22 under 35 U.S.C. 101 is withdrawn.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

8. Claims 1-2 and 7 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Kennel(US 5410166). Kennel teaches a thermal conversion device having a source of electron tunneling(voltage source) connected to the emitter which when pulsed, produced an electron tunnel to the anode 104, where the anode can be

manipulated at 108. Kennel teaches the emitter and collector connected a circuit as a thermionic generator or switch. The thermionic generator being in a housing 102 is flexible to allow the movement of the manipulating means and the anode 104. It is inherent that the manipulator 108 includes some form of means for assessing the electrode distance.

9. Claims 1, 2, 4, 7, 23, and 24 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Hatsopoulos and Gyftopoulos(H&G). H&G teach thermionic diode having a flat emitter and collector. H&G teach a manipulator(spacing adjustment mechanism) to control the relative spacing of the electrodes. It is inherent that a power converter is connected to an electrical load. H&G teaches thermionic converter in a vacuum housing which is flexible to allow the movement of the electrodes. H&G shows the electrode adjustment means which is activated by a human and which inherently can determine the spacing of the electrodes.

10. Claims 1, 2, 8-16, 23, 24, and 27 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by DiMatteo(US 6,084,173). DiMatteo teaches an energy converter having an emitter 1 connected to a heat source and a collector 2 connected to a cool source, which is connected to a circuit as photovoltaic(sunlight) generator and is inherently positioned in a flexible housing which allows the adjustment of the electrodes. DiMatteo teaches piezoelectric actuators to adjust the position of the electrodes which inherently includes a control means for the electrodes.

11. Claims 23 and 28 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Rason et al.(Rason)(US 3,843,896). Rason teaches a diode with flat matching surfaces between the electrodes. Rason teaches the emitter and collector made from different materials, which inherently have different coefficients of thermal expansion.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over H&G, Kennel, or DiMatteo, in further view of Rason et al.(Rason)(US 3,843,896). H&G, Kennel, and DiMatteo, each individually teach every aspect of the invention except the housing being thermally conductive. Rason teaches a conductive housing to allow heat to pass in and out of the converter. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the energy converter of H&G, Kennel, or DiMatteo with the conductive housing of Rason to allow heat pass into the energy convert to generate electricity.

14. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over H&G, Kennel, or DiMatteo, in further view of Yasuda(US 5,487,790). H&G, Kennel, and

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DiMatteo, each individually teach every aspect of the invention except the metal powder on the collector electrode. Yasuda teaches a metal powder on the collector electrode. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the energy converter of H&G, Kennel, or DiMatteo with the metal powder on the collector electrodes because Yasuda teaches to help efficiently convert solar heat to electricity.

15. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over DiMatteo, in further view of Cox(US 6,6064,137). DiMatteo teaches every aspect of the invention except a voltage source to operate the device as a heat pump. Cox teaches it is know to provide a voltage source 23 to a thermionic converter to operate the device as a heat pump. It would have been obvious to a person skilled in the art at the time of the invention to construct the converter of DiMatteo with the voltage source of Cox to operate the device as a heat pump.

16. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over DiMatteo or H&G. DiMatteo and H&G, each individually teach every aspect of the invention except the collector and emitter positioned within 200 or 100 angstroms. It would have been obvious to a person skilled in the art at the time of the invention to construct the diode of DiMatteo or H&G with the electrode spacing of 200 or 100 angstroms to provide and small air gap to reduce thermionic leakage around the collector.

17. Claims 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rason, in further view of Richards(US 4,281,280) and Edelson(US 5,874,039). Rason teaches every aspect of the invention except the collector being aluminum and emitter being titanium with a difference of thermal expansion being 4-1. Richards teaches aluminum is a known anode material. Edelson teaches titanium is a known emitter material. It would have been obvious to a person skilled in the art at the time of the invention to construct the energy converter of Rason with the aluminum anode of Richards and the titanium emitter of Edelson because mere selection of known parameters is within the ordinary skill in the art and because Richards and Edelson teaches the materials are sufficient for electrode structures in thermionic converters.

18. Claims 33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rason, in further view of Cox(US 6,064,137). Rason teaches every aspect of the invention except the method of forming the converter through layers with a non-destructive removal of a middle layer. Cox teaches a thermionic converter formed with layers having a non-destructive removal of a middle layer. It would have been obvious to a person skilled in the art at the time of the invention to construct the energy converter of Rason by the method of Cox to provide precise positioning of the electrodes.

19. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rason and Cox. Rason and Cox teach every aspect of the invention except positioning the electrodes within 200 or 100 angstroms. It would have been obvious to a person skilled in the art at the time of the invention to construct the diode of Rason and Cox with the electrode spacing of 200 or 100 angstroms to provide and small air gap to reduce thermionic leakage around the collector.

20. Claims 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rason and Cox. Rason and Cox teach every aspect of the invention except piezoelectric positioning the electrodes. DiMatteo teaches piezoelectric positioners to adjust the spacing of the electrodes. It would have been obvious to a person skilled in the art at the time of the invention to construct the diode of Rason and Cox with the actuators of DiMatteo to make fine adjustments to the electrode spacing.

Allowable Subject Matter

21. Claim 6 is allowed.

Response to Arguments

22. Applicant's arguments filed 9/14/01 have been fully considered but they are not persuasive. The Applicant's argument regarding the AC voltage generator is not persuasive. The specification does not contain a "full, clear, concise, and exact" written description of the means for producing AC voltage. The specification states that the actuator elements will be pulsed, but that is a functional recitation of the operation of the

device, and not a full, clear, concise, and exact written description of the device or circuit which will pulse the active control elements. Therefore, recitation of claim 18 is merely and intended use of the apparatus to generate AC voltage rather than an actual structural limitation. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations, *Ex parte Masham* 2 USPQ2d 1647 (1987).

The Applicant's argument that Kennel does not teach a collector and emitter with an electron tunnel or a energy source for promoting tunneling are not persuasive. It is inherent that the electrodes are sufficiently close to allow thermionic tunneling. Kennel teaches an electron tunnel from the substrate to the anode 104 which is controlled by pulsing a voltage source to the either electrode. Kennel reads on the claim limitations, therefore the rejection is proper and maintained. The Applicant's arguments regarding H&G are not persuasive because thermionic tunneling reads on the claim limitations. The Applicant's argument regarding DiMatteo is not persuasive. DiMatteo teaches a photovoltaic cell where photons are emitted from the emitter to the collector with the semiconductor electrodes spacing being controlled by piezoelectric actuators. The Applicant's argument that Rason does not teach matching electrode surfaces is not persuasive. Rason teaches matching flat surfaces on the electrodes which are mounted parallel to each other(a topographically matching feature). The Applicant's arguments regarding the spacing of the electrodes is not persuasive because a person skilled in the arts would be motivated to optimize the spacing of the electrodes to

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determine the most efficient position.

Conclusion

Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karl I.E. Tamai at (703) 305-7066. The examiner can be normally contacted on Monday through Friday from 8:00 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Nestor Ramirez, can be reached at (703)308-1371. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist at (703) 308-0956.

Karl I Tamai
PRIMARY PATENT EXAMINER
November 5, 2001

KARL TAMAI
PRIMARY EXAMINER

